Report

Fare Structure and Strategy Review

V1.1

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1 Introduction

This Fare Structure and Strategy Review report is the capstone of the Transit Windsor Fare Structure study. It provides clear recommendations that stem from a review of current policy, a best-practices review of peer agencies, and an impact assessment of three decision packages made up of selected policy modifications.

Section 2 of this report provides a summary of existing fare structure and policy, to give context to the recommendations for change.

Section 3 presents alternatives for modifying fare levels and structure, fare policy, and fare payment technologies, as well as the likely impacts of adjustments in each of these areas.

Section 4 selects from the fare structure and policy modifications introduced in Section 3, presenting three fare structure alternatives based on varying priorities. This section also includes a comparative evaluation of the impact of each package on system revenue and ridership.

Section 5 discusses the rationale for the recommended fare strategy and outlines implementation. This section includes fare structure recommendations for the smartcard system and the introduction of mobile ticketing. A work plan for implementation, together with timeframes and costs, will be the outcome of a later task.

We have included four appendixes:

- A review of Transit Windsor's current fare structure (Appendix A);
- A review of the fare structures, media, and technologies for six peer agencies—Halifax, London, Mississauga, Oakville, Saskatoon, and Victoria (Appendix B);
- A white paper on fare policies enabled by smartcards (Appendix C); and
- A white paper on fare policies enabled by mobile ticketing applications (Appendix D).

2 Existing Fare Policy

The existing fare structure for Transit Windsor was reviewed as part of Task 1 of this study, which can be found attached in Appendix A. A summary table describing the fare classes and costs is shown in Exhibit 2-1. Under the current fare policy:

- Seniors (age 60 and older) are offered reduced prices on tickets and monthly passes;
- Children under 5 ride free when accompanied by a fare-paying adult, while children 5 and older pay the Student fare for either tickets or monthly passes if they are attending an accredited elementary, secondary, or post-secondary school on a full-time basis;
- The Student fare applies to persons age 5 and older who are registered at and attending full-time an accredited educational institution up to and including the age of 19. This fare category is not available to students attending part-time, or university or college students covered by a U-Pass agreement with Transit Windsor.
- University of Windsor students are provided with an annual student pass paid for through their tuition. The pass is valid from September 1 through April 30. University students may purchase, as an option, a summer pass valid from May 1 through August 31.
- Recipients of the Ontario Disability Support Program (ODSP) or Ontario Works (OW), and individuals with income below the Low Income Cut-off (LICO) as defined by Statistics Canada may apply for the Affordable Pass Program (APP), which allows them to purchase a monthly pass at a reduced rate;
- Tunnel service carries a $2.00 premium over the local transit adult fare while the monthly pass rate for tunnel service is the same as the local transit monthly pass;
- Combination local and tunnel monthly passes are available for a $34 discount on the combined price of these passes if purchased separately; and
- Riders can transfer to any other route in any direction within 2 hours of their initial boarding using a printed transfer issued by the bus operator.

Exhibit 2-1: Existing Fare Levels and Structure

Fare Class	Fare Products			
	Cash	Ticket *(ea.)*	Daily	Monthly
Adult	$ 3.00	$ 2.53	$ 9.00	$ 95.70
Senior	$ 3.00	$ 1.98	$ 9.00	$ 48.40
Student	$ 3.00	$ 1.98	$ 9.00	$ 66.00
APP *(Affordable Pass Program)*	$ -	$ -	$ -	$ 48.40
USA Tunnel Service	$ 5.00	$ -	$ -	$ 95.70
Combination *(Tunnel & Local)*	$ -	$ -	$ -	$ 157.00
Summer Saver	$ -	$ -	$ -	$ 105.50
Restricted Monthly	$ -	$ -	$ -	$ 44.00
Restricted Semester	$ -	$ -	$ -	$ 220.00

Transit Windsor makes limited use of smartcards for certain groups of users such as Student Transportation Services, Corporate Pass holders, and U-Pass holders. Each group of users is priced individually dependent upon a negotiated contract. An EZV36 farebox system upgrade (by vendor Trapeze) is currently being implemented. The farebox upgrade will include an optical

reader for scanning matrix barcodes (as will be discussed further, this could enable options including automated validation for mobile ticketing).

The remainder of this report focuses on:

- Potential modifications to current fare structure and policies, in the context of the intended changes to payment systems;
- Proposed alternative fare structure and policies that Transit Windsor should consider implementing; and
- Assessing the likely impacts of these fare structure and policy adjustments.

3 Alternative Fare Structures, Policies, and Technologies

Fare structure, fare policies, and payment technologies are three variables under the control of Transit Windsor that have significant impact on ridership, revenue, and the overall relationship between the transit service provider and riders. Policies that change these areas will impact transit riders, and will likely be heavily scrutinized. Accordingly, to make an informed and defensible decision regarding policy in any of these areas, it is important to have a clear view of the likely impacts for modifications in any of these areas.

The following sections discuss alternative fare structures, policies, and payment technologies and their overall impacts.

3.1 Fare Structure

The fare structure is a listing of the various fare rates applicable to defined transit rider categories and is adjusted periodically as necessary and approved by City Council. The structure is based on the price for a single base (adult) trip and how this price changes for each type of fare category offered.

As an example, Transit Windsor's current adult single ride fare is $3.00. A sheet of five tickets is available for $12.65, which represents $2.53 per ride or an approximate 15% discount on the single cash fare. The daily and monthly passes offer further cost savings which increase according to the number of trips taken within the specified time period. The price of the daily and monthly passes is based on a multiplier between the base cash fare and a specific number of trips. For example, the $9.00 adult daily pass is three times the single ride base cash fare while the adult monthly pass is approximately 32 times the single ride base cash fare.

3.1.1 Impacts of Fare Changes

When modifying the fare structure, changes can be made to each fare class and product separately. This approach can separately modify the discount available through various fare products and the multipliers used between the adult single ride fare and time-based passes, which can have the effect of shifting which fare products are more attractive to transit riders. Alternately, the fare rates within the fare structure can be made so as to maintain the relative multipliers between fare products by applying either across-the-board percentage increases, or individual changes to each rate.

Across-the-board fare increases are typically accompanied by corresponding decreases in overall ridership especially if the increases are high (10% or more). Conversely, an overall fare decrease could increase overall ridership although to a limited amount. Transit users typically respond more to service improvements, compared to fare decreases. As well, transit use can increase at the time of a fare increase if the increase coincides with service improvements.

Fare increases are necessary to maintain a sustainable revenue stream and provide adequate funding for maintaining service levels as well as the transit infrastructure maintenance. As such, if fares were to remain flat for a long period of time without additional funds to cover inflationary cost increases contributed from other funding sources, transit agencies can be forced to reduce expenditures. This could include cutting important capital upgrades, maintenance budgets, or even transit service. These cuts can result in a transit agency becoming less efficient and effective at delivering quality transit service to riders.

Increasing or decreasing fares for particular fare classes and products can mitigate the negative ridership impact of a fare increase. For example, if an agency increases the price of monthly passes while maintaining the price of the single fare it may find a smaller drop in ridership than

typically expected in comparison to increasing prices a smaller amount across the board. This is due partially to frequent riders, such as those using transit for their work commute, tending to be less willing to change their travel patterns in response to price changes as compared to the occasional riders who typically purchase single fares.

However, there is a limit to the capacity for fare increases on frequent riders. If the multiplier between a single fare and the monthly pass increases to a point that frequent riders and commuters would find savings by instead purchasing tickets or single ride fares, an agency could see a larger than expected decline in ridership as former pass holders that switch to single fares could end up paying less than the monthly pass price depending on their actual number of transit trips. There could also be an impact on the relationship between the transit agency and frequent riders, who may feel that they are the best customers of the transit agency and are being penalized for it. This introduces the risk of a mode shift among regular commute riders to an alternative non-transit travel method.

Alternatively, prices for frequent riders may be decreased in an effort to shift semi-frequent riders from purchasing single fares or tickets to monthly passes. Once a rider owns a time-based unlimited use pass, they are more likely to use transit for additional discretionary trips thereby increasing overall transit ridership.

3.2 Concession Fares

Concession fares are discounts provided to defined groups, generally those with low personal incomes, people with disabilities or mobility limitations, children under a certain age, students, and seniors. The purpose of providing discounted fares varies by group.

Low-income riders: Transit riders with low personal incomes are frequently reliant on public transit as their main source of mobility. Having access to transit can be the biggest factor in being able to reliably get to work on time to maintain a job. At the same time, due to their limited income, to maintain this mobility these riders spend a larger proportion of their income on transportation than the average rider. After housing costs and transportation costs, this can leave these riders with little remaining income to get ahead or save for the future. Providing discounted fares can be a significant benefit and result in more positive outcomes for these riders and the community as a whole.

Disabled passengers: Riders with disabilities or mobility limitations can similarly face obstacles in that they frequently rely on transit for personal mobility and can often be living on limited incomes. Providing discounted fares to these riders can help mitigate the negative impact of their disability and provide an affordable way to access important social services.

Children: Free or significantly discounted rides for children under a certain age (currently 5 years old for Transit Windsor) are a way to reduce the cost of transit for parents travelling with their children. Whether it’s a trip to the grocery store, doctor’s office, or anywhere else, paying an additional full fare for a child can often result in the trip being made by private car or not made at all. Riding transit as a child can also help create lifetime customers, as children learn how and where transit operates, how to access it, and how convenient it can be. As they grow up, these children may ride transit more frequently than children who have never taken transit before.

Students: Discounted rides for students can also be a way to build future ridership, whether enrolled in elementary, secondary, or post-secondary institutions. Similar to the policy for children, students who become familiar and comfortable with taking transit may take transit more frequently even after they no longer qualify for student discounts. Students frequently also are living on limited incomes, many with no access to alternative modes of travel, making them reliant on transit for personal mobility.

Seniors: Lastly, the policy of providing significantly discounted fares to senior citizens is generally intended to improve the mobility of seniors no longer able to safely drive themselves

and to reduce costs for seniors on fixed incomes. Senior fares are also frequently tied to travel in off-peak periods when crowding is minimal and there is little to no additional cost to provide these rides, as no additional transit service is added to accommodate the demand.

While providing discounts to each of these groups can result in significant costs, these are typically considered as outweighed by the societal benefits. However, these societal benefits do not accrue directly to the transit agency so it is common for transit agencies providing these benefits to recoup at least a portion of the costs for a discount from other agencies with a mandate to provide aid and benefits for that group.

3.3 Payment Technologies

Several emerging payment technology options are available, with such technologies rapidly evolving from system suppliers and the financial industry. Considering the capabilities of the current Trapeze system, a logical next step would be for Transit Windsor to expand the use of smartcards and introduce mobile ticketing and it is our understanding that Transit Windsor is intending to do so.

A key issue is deciding what fare products will continue to be offered using methods other than these new payment technologies, and at what pace any changes to conventional fare media options will be made. Withdrawing the paper formats for various fare products such as passes, tickets, and transfers can influence regular riders to adopt use of the new fare technologies.

But such changes can also be controversial, in particular for supporting rare or one-time users and among rider classes who can contend that the new technologies are problematic for them to adopt (e.g., not having a credit card, difficulty accessing reload infrastructure). If cash use for fare payment can be highly reduced an agency might even consider eliminating cash acceptance, but this would typically also similarly result in equity concerns from riders who feel cash is their necessary or preferred option.

3.3.1 Smartcards

Smartcards are a form of contactless fare media that can bring several benefits to transit agencies and customers, such as reduced fare transaction (and thus dwell) times during boarding.

Smartcard systems operate under one of two fundamental architectures: “card-based” and “account-based”. In card-based systems, user and account information is stored on the smartcard. In account-based systems, the card serves as an account identifier and the account information is stored in the back office. Transit Windsor’s current farebox supports smartcards using a card-based architecture.

Regardless of the system architecture, smartcard systems can enable attractive functionality for customers, and simplify data reconciliation and financial operations. Customers can purchase fare products online or over the phone and have these added directly to their smartcard. This reduces costs associated with printing conventional paper fare media and dealing with processing cash from fares, while allowing customers the convenience to buy fare products remotely. Add-value machines can also be deployed to support the issuance of smartcards and loading fare products onto smartcards at convenient locations.

Multiple fare products can be made available for use on a smartcard. Typically smartcards can be loaded depending on the system capabilities and how the system is configured with some combination of concession fare eligibility, stored value, single-ride tickets, and varying types of period passes (e.g. daily pass, monthly pass, 7-day or 30-day rolling pass). User accounts can also be configured for a pre-arranged recurring purchase of stored value or other fare products based on a calendar interval for dropping below a balance threshold.

Transit Windsor's current fare system supports smartcards using a card-based architecture but not supporting stored value, with smartcard-based passes already in use by selected ridership classes. Refer to Appendix C for a further discussion of fare policy considerations for smartcard systems.

3.3.2 Mobile Ticketing

Mobile ticketing involves purchasing transit fare products through a mobile device, thus leveraging the existing population of mobile phones to serve as both the fare medium and a method to purchase fare products. The devices needed to use mobile ticketing are already in the hands of many customers, and the mobile-ticketing vendor provides the app, supporting software, and sometimes onboard and central hardware

Transit Windsor's fareboxes can read linear or matrix barcodes and thus can support mobile ticketing products that use supported barcode formats. In particular, the farebox vendor, Trapeze, offers a mobile ticketing product that could be implemented readily.

Mobile ticketing software is operated and maintained by the vendor as a hosted solution that is enabled with a customer-facing application. The app and hosted software enable customer fare media purchase/display. There is a potential role for onboard hardware to support fare media validation; otherwise, the operator has to validate the fare visually. The hosted software also provides agencies with data and reports, and also configuration capabilities to manage transactions and payment options.

Online purchases (for stored value, tickets and passes) transfer value over secure internet connections from linked accounts (e.g., credit card, PayPal). This "purchase anywhere" feature is especially important component of adding mobile ticketing to the fare collection system: to avoid fare purchases being limited to fixed locations, and reduce the amount of physical point-of-sale infrastructure needed.

Mobile ticketing can be configured to support multiple fare product options including stored value, single-ride tickets, "rolling activate on first use" passes, and "calendar" passes (e.g. daily, monthly). Accounts may also be setup to make recurring purchases at a set calendar interval (e.g. automatic purchase of the next weekly or monthly pass on set dates) or to purchase a set amount of stored value whenever the stored value balance drops below a set threshold.

Refer to Appendix D for further discussion of mobile ticketing.

4 Fare Strategy Decision Packages and Estimated Impacts

The subsections below describe the three fare strategy decision packages developed for evaluation as part of this study. These packages include varying fare levels, fare structures, modifications to concession fares, and how to apply these using the fare payment technologies. Following the description of each decision package, this section also details the impact on system level ridership and revenue for each package.

4.1 Decision Packages

While an infinite number of decision packages could be created with minor variations in fare levels, the resulting difference in impact between each of the scenarios would be minimal. Instead, three decision packages have been developed with variations that represent a range of reasonable fare strategies based on industry trends, best practices, and a review of peer agency policies.

Some elements are common between all three packages, where there is clear evidence for the policy. These common features are included in each decision package because their exclusion from any package would be detrimental. These common features include:

- **Raising the age limit for free rides for children**. The existing Transit Windsor policy caps free rides for children at 4 years old, meaning a 5 year old travelling with a parent to or from their kindergarten class would be subject to the full $3.00 fare if paying cash, or $1.98 if they purchase a sheet of tickets. The impact of this policy is that existing riders with young children are more likely to shift to driving for such trips to avoid this additional cost.

  Through the peer review it was found that London has adopted a policy of allowing kids up to 12 years old to ride free, without the need to be accompanied by an adult, while Halifax provides a discounted fare for kids up to 15 at a cheaper rate than that for students.

  By increasing the age limit for free rides for kids when accompanied by a parent from 5 to 12, Transit Windsor could keep more transit-riding parents from switching to driving their kids, which create more potential lifetime riders through getting more kids to ride transit more frequently.

  This change would have a small impact on fare revenue and no impact on system costs. In 2016, recorded child trips totalled 146,000, or 2.3% of the system total. From a cost perspective, given that the majority of trips by children fall outside of the traditional peak-periods, even a doubling of these trips would likely be accommodated with little or no change in the amount of transit service needed to appropriately serve ridership demand.

  The expansion of the current kids ride free policy without additional dedicated funding could result in an erosion of fare revenues. Given a fixed operating budget and target farebox recovery ratio, this potential reduction in fare revenue could negatively impact the ability of Transit Windsor to provide transit service. To avoid these negative impacts, it is important to have a separate guaranteed fund from the City to cover any potential loss in fare revenue by Transit Windsor.

  A mechanism to count the number of free rides provided may also be necessary to estimate the revenue loss. This could be accomplished by a number of methods including distributing electronic fobs to children as in London, semi-regular passenger counts, or direct recording by operators.

- **Modifying the current student fare to apply only to secondary students**. As currently implemented the student fare applies to both secondary and post-secondary students. However, with the creation of the U-Pass pilot program all full-time post-secondary students at the University of Windsor have unlimited access to Transit Windsor buses. Based on the positive experience Transit Windsor has had to-date with the U-Pass program and the ridership growth it has driven, we recommend further expanding this program to include full-time post-secondary students at St. Clair College. Eliminating the existing student fare discount for post-secondary students will likely encourage the student associations at the University of Windsor to renew and at St. Clair College to enter into an unlimited pass program.

  As discussed in the Task 2 report on Peer Agency Fare Structures (Appendix B), this is a common adjustment to fare policy being made by transit agencies across Canada. By eliminating student fares for post-secondary students, Transit Windsor can simplify the procedures surrounding student passes with minimal impact on post-secondary students. Due to the implementation of the U-Pass, this change is not expected to have a significant impact on fare revenue or transit service costs.

- **Adding single-ride and daily pass options to the APP**. The existing Transit Windsor policy limits APP riders to monthly passes. While these passes are made more affordable thanks to the concession fare offered, the $50 price can be a burden if paid all at once. Some users may also not need to use transit for the whole month, but would be reliant on transit for some proportion of the month.

  Once a customer was qualified for the Affordable Pass Program, their farecard would be set appropriately (like any other concession card), and could be loaded with the products the customer wants: the monthly pass, or the proposed single-ride fares or daily pass.

  APP users may find that single-ride and daily pass offerings can help reduce the burden of the higher one-time cost of the monthly pass and allow them more flexibility in managing their cash flow and transportation needs. This improvement requires the use of electronic fare media and associated fareboxes which are discussed further in Section 3.3. Due to the small portion of total riders represented by APP holders and the existing availability of the APP monthly pass, this change is not expected to have a significant impact on fare revenue or transit service costs.

- **Maintaining time-based transfers.** Many transit agencies, including Victoria Regional Transit as discussed in the Peer Review completed in Task 2 of this study (Appendix B), have recently investigated or adopted the policy of eliminating transfers from their systems. The arguments for eliminating transfers are that administering transfers can be a distraction for bus operators, complicate the boarding process, and are potentially abused by those looking to game the system.

  However, by charging for transfers transit agencies are penalizing riders for the agency's inability to provide direct connections between a desired origin and destination (OD) pair. Even where it possible to provide a direct service between all major OD pairs, the costs would be exorbitant and service relatively infrequent. Instead, by designing self-supportive grid-based networks and allowing passengers to board connecting buses for no additional charge, transit agencies can use these networks to approximate direct connections between all origins and destinations. Transit Windsor is currently conducting a service delivery review, which may alter its network, and thus affect the number of transfers. As this recommendation is to continue current practice, this policy is not expected to have an impact on fare revenue or transit service.

- **Replacing monthly passes with rolling 30-day passes.** This change is intended to improve customer convenience by eliminating the need to purchase a pass for each calendar month during the first few days of each month. Instead, riders may purchase a pass at any time which is valid for travel for 30 days from the date of the first trip taken with the pass. This change allows for increased flexibility for riders in determining whether a frequent rider pass makes sense for them based on their schedule instead of based on the calendar. This type of pass requires the use of electronic fare media and associated fareboxes, both of which are discussed in Section 3.3. Moving to a rolling time-based pass will also help alleviate the long lines that typically occur during the first few days of the month when frequent riders purchase their new monthly passes. As this change is aimed at improving customer convenience, it is not expected to significantly impact fare revenue or transit service costs.
- **Eliminating single-ride tickets and passes in favour of equivalent products carried on smartcards and mobile ticketing**. This is a forward looking policy intended to modernize the Transit Windsor fare media options. As this is also a customer convenience improvement, it is not expected to significantly impact fare revenue or transit service costs, excluding capital costs to develop and deploy the system. See Section 3.3 for further discussion. Elimination of the legacy fare products should only be done once their equivalent availability through electronic fare media is seen by the public as sufficiently available and reliable.
- **Provide no further discount to senior fares**. As discussed in Section 3.2, senior discounts are provided to riders over 60 years of age and are generally intended to improve mobility and reduce costs for those no longer able to drive themselves or those living on fixed incomes.

  Through the course of this study the idea of free fares for seniors has been raised. We estimate the revenue loss of such a plan to be between approximately $750,000 and $1,000,000 annually over the next five years. This represents a loss of approximately 8% of annual operating revenue while serving only approximately 10% of Transit Windsor riders.

  The peer review found that the cities of London, Saskatoon, and Victoria currently have eliminated senior-specific discounts on some or all fare products. Further details on the peer review may be found in Appendix B. Increasing the quantity of transit service provided has generally been found to have a much greater impact on ridership and perception of service quality than reducing fares. Given that Transit Windsor already offers substantial discounts to seniors both in terms of age qualification and fares for Daily and Monthly passes, it is our recommendation that the existing senior fare not be further reduced.

4.1.2 Strategy 1: Inflation Adjusted Fares

The first decision package is referred to as the Inflation Adjusted Fares package, with the fare levels in this package set such that they keep pace with the expected rate of inflation (approximately 2% per year). A summary of the existing fare structure, the resulting fare structure in 2023, and the change in fare structure as a result of adopting this decision package are shown in Exhibit 4-1.

Exhibit 4-1: Inflation Adjusted Fares (Strategy 1) Fare Levels and Structure

Fare Class	Existing Fares				2023				Fare Increase (%Increase)			
	Cash	Ticket *(each)*	Daily Pass	Monthly Pass	Cash	Single Fare**	Daily Pass	30-Day Pass***	Cash	Single Fare	Daily Pass	30-Day Pass
Adult	$ 3.00	$ 2.53	$ 9.00	$ 95.70	$ 3.30	$ 2.79	$ 9.95	$ 105.66	$ 0.30 (10%)	$ 0.26 (10%)	$ 0.95 (11%)	$ 9.96 (10%)
Senior	$ 3.00	$ 1.98	$ 9.00	$ 48.40	$ 3.30	$ 2.19	$ 9.95	$ 53.44	$ 0.30 (10%)	$ 0.21 (10%)	$ 0.95 (11%)	$ 5.04 (10%)
Youth *(13 to 19 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.30	$ 2.19	$ 9.95	$ 72.87	$ 0.30 (10%)	$ 0.21 (10%)	$ 0.95 (11%)	$ 6.87 (10%)
Student	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.30	$ 2.79	$ 9.95	$ 105.66	$ 0.30 (10%)	$ 0.81 (41%)	$ 0.95 (11%)	$ 39.66 (60%)
Child *(5 to 12 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ -	$ -	$ -	$ -	$ -3.00 (-100%)	$ -1.98 (-100%)	$ -9.00 (-100%)	$ -66.00 (-100%)
APP *(Affordable Pass Program)*	$ -	$ -	$ -	$ 48.40	$ -	$ 1.41	$ 5.00	$ 53.44	-	-	-	$ 5.04 (10%)

** Post-secondary student passes are included in tuition costs*

*** Smart card or mobile payment to replace tickets*

**** Rolling 30-Day Pass to replace existing Monthly Pass*

As shown in Exhibit 4-1, this strategy:

- Maintains current discounts for senior fares;
- Maintains student discounts on fares and passes, renames the category to 'Youth', and limits availability to those between the ages of 13 and 19;
- Eliminates discounts for post-secondary student fares (replaced by U-Pass for UWindsor students);
- Extends the kids-ride-free policy for up to and including 12 year olds when accompanied by an adult;
- Replaces paper tickets and passes with equivalents carried on the smartcards and mobile ticketing;
- Replaces the monthly pass with a rolling 30-day pass;
- Introduces single-ride and daily pass options to APP;
- Increases the cost of all fare products by 2% per year over 5 years.

4.1.4 Strategy 2: Fare Freeze

The second decision package is referred to as the Fare Freeze package, as the fare levels in this package are maintained at existing levels. A summary of the existing fare structure, the resulting fare structure in 2023, and the change in fare structure as a result of adopting this decision package are shown in Exhibit 4-2.

Exhibit 4-2: Fare Freeze (Strategy 2) Fare Levels and Structure

Fare Class	Existing Fares				2023				Fare Increase (%Increase)			
	Cash	Ticket *(each)*	Daily Pass	Monthly Pass	Cash	Single Fare**	Daily Pass	30-Day Pass***	Cash	Single Fare	Daily Pass	30-Day Pass
Adult	$ 3.00	$ 2.53	$ 9.00	$ 95.70	$ 3.00	$ 2.53	$ 9.00	$ 95.70	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)
Senior	$ 3.00	$ 1.98	$ 9.00	$ 48.40	$ 3.00	$ 1.98	$ 9.00	$ 48.40	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)
Youth *(13 to 19 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)	$ 0.00 (0%)
Student	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.00	$ 2.53	$ 9.00	$ 95.70	$ 0.00 (0%)	$ 0.55 (28%)	$ 0.00 (0%)	$ 29.70 (45%)
Child *(5 to 12 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ -	$ -	$ -	$ -	$ -3.00 (-100%)	$ -1.98 (-100%)	$ -9.00 (-100%)	$ -66.00 (-100%)
APP *(Affordable Pass Program)*	$ -	$ -	$ -	$ 48.40	$ -	$ 1.28	$ 4.55	$ 48.40	-	-	-	$ 0.00 (0%)

** Post-secondary student passes are included in tuition costs*
*** Smart card or mobile payment to replace tickets*
**** Rolling 30-Day Pass to replace existing Monthly Pass*

As shown in Exhibit 4-2, this strategy:

- Maintains current discounts for senior fares;
- Maintains student discounts on fares and passes, renames the category to 'Youth', and limits availability to those between the ages of 13 and 19;
- Eliminates discounts for post-secondary student fares (replaced by U-Pass for UWindsor students);
- Extends the kids-ride-free policy for up to and including 12 year olds when accompanied by an adult;
- Replaces paper tickets and passes with equivalents carried on the smartcards and mobile ticketing;
- Replaces the monthly pass with a rolling 30-day pass;
- Introduces single-ride and daily pass options to APP;
- Freezes the costs of all fare products at 2018 levels.

4.1.6 Strategy 3: Frequent Rider Discount

The third and final decision package is referred to as the Frequent Rider Incentive package, as the fare levels in this package are adjusted such that the cost of the monthly pass is maintained at current levels while all other fare products are increased at the rate of inflation. A summary of the existing fare structure, the resulting fare structure in 2023, and the change in fare structure as a result of adopting this decision package are shown in Exhibit 4-3.

Exhibit 4-3: Frequent Rider Incentives (Strategy 3) Fare Levels and Structure

Fare Class	Existing Fares				2023				Fare Increase (%Increase)			
	Cash	Ticket *(each)*	Daily Pass	Monthly Pass	Cash	Single Fare**	Daily Pass	30-Day Pass***	Cash	Single Fare	Daily Pass	30-Day Pass
Adult	$ 3.00	$ 2.53	$ 9.00	$ 95.70	$ 3.30	$ 2.79	$ 9.95	$ 95.70	$ 0.30 (10%)	$ 0.26 (10%)	$ 0.95 (11%)	$ 0.00 (0%)
Senior	$ 3.00	$ 1.98	$ 9.00	$ 48.40	$ 3.30	$ 2.19	$ 9.95	$ 48.40	$ 0.30 (10%)	$ 0.21 (10%)	$ 0.95 (11%)	$ 0.00 (0%)
Youth *(13 to 19 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.30	$ 2.19	$ 9.95	$ 66.00	$ 0.30 (10%)	$ 0.21 (10%)	$ 0.95 (11%)	$ 0.00 (0%)
Student	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ 3.30	$ 2.79	$ 9.95	$ 95.70	$ 0.30 (10%)	$ 0.81 (41%)	$ 0.95 (11%)	$ 29.70 (45%)
Child *(5 to 12 years)*	$ 3.00	$ 1.98	$ 9.00	$ 66.00	$ -	$ -	$ -	$ -	$ -3.00 (-100%)	$ -1.98 (-100%)	$ -9.00 (-100%)	$ -66.00 (-100%)
APP *(Affordable Pass Program)*	$ -	$ -	$ -	$ 48.40	$ -	$ 1.41	$ 5.00	$ 48.40	-	-	-	$ 0.00 (0%)

** Post-secondary student passes are included in tuition costs*

*** Smart card or mobile payment to replace tickets*

**** Rolling 30-Day Pass to replace existing Monthly Pass*

As shown in Exhibit 4-3, this strategy:

- Maintains current discounts for senior fares;
- Eliminates discounts for post-secondary student fares (replaced by U-Pass for UWindsor students);
- Eliminates discounts for post-secondary student fares (replaced by U-Pass);
- Extends the kids-ride-free policy for up to and including 12 year olds when accompanied by an adult;
- Replaces paper tickets and passes with equivalents carried on the smartcards and mobile ticketing;
- Replaces the monthly pass with a rolling 30-day pass;
- Introduces single-ride and daily pass options to APP;
- Freezes the cost of the monthly pass at 2018 levels; and
- Increases the cost of all other fare products by 2% per year over 5 years.

4.3 Comparative Impacts

Ridership impacts resulting from fare structure changes are calculated using an elasticity based approach, while revenue estimates are based on average fare prices. Elasticities are a way to calculate a change in demand of a good relative to the change in its price. The general equation used to calculate a change in demand is shown in **Equation 1**.

$$\frac{\Delta D}{D_1} = e_D \cdot \frac{\Delta P}{P_1} \qquad \textbf{Eq. 1}$$

Where:

ΔD = Change in demand

D_1 = Original quantity demanded

e_D = Elasticity of demand

ΔP = Change in price

P_1 = Original price for pre-defined quantity

Several factors can impact elasticity values including trip type, time of trip, passenger income, and many other variables. For the purposes of this study a value of -0.43 is used.[1] This would mean that for every unit of price increase there would be a demand decrease of 0.43. This value represents an average for all hours appropriate for cities with population under 1,000,000 and has been used widely in similar applications throughout North America.

Exhibits 4-4 through 4-9 below summarize the estimated ridership and revenue impacts resulting from adopting the various decision packages discussed in Section 4.1. Note that comparisons made to 2016 values exclude ridership and revenue projections for children and APP riders. These categories are excluded because the APP ridership data and child revenue data were not available. The impact of the exclusion of these categories on this process is expected to be minimal, as they represent only a small percentage of total riders and revenue and are treated the same under all three decision packages.

Exhibit 4-4: Strategy 1 System Ridership Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	935,600	334,100	1,405,600	2,675,300
Senior	198,500	117,500	452,400	768,400
Youth *(13 to 19 years)*	938,300	579,700	852,100	2,370,100
Post-Secondary Student	13,200	-	346,000	359,200
Other *(E.g. Tunnel, Combo, Auto Show)*	164,900	-	31,100	196,000
Total	**2,250,500**	**1,031,300**	**3,087,200**	**6,369,000**
(Ratio to 2016)	***(1.00)***	***(1.00)***	***(1.00)***	***(1.00)***

[1] Todd Litman, “Transportation Elasticities”, http://www.vtpi.org/tdm/tdm11.htm (January 2, 2017)

Exhibit 4-5: Strategy 1 System Revenue Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	$ 4,006,400	$ 933,200	$ 958,400	$ 5,898,000
Senior	$ -	$ 256,800	$ 549,000	$ 805,800
Youth *(13 to 19 years)*	$ -	$ 1,267,200	$ 1,639,500	$ 2,906,700
Post-Secondary Student	$ -	$ -	$ 820,100	$ 820,100
Other *(E.g. Tunnel, Combo, Auto Show)*	$ -	$ 698,700	$ 2,247,900	$ 2,946,600
Total	**$ 4,006,400**	**$ 3,155,900**	**$ 6,214,900**	**$ 13,377,200**
(Ratio to 2016)	***(1.10)***	***(1.08)***	***(1.06)***	***(1.08)***

As shown in Exhibits 4-4 and 4-5, this scenario is expected to maintain current ridership levels while increasing revenues by 9% overall. Ridership is flat due to the 2% year-to-year fare increase, which is what drives the increase in revenue.

Exhibit 4-6: Strategy 2 System Ridership Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	972,300	347,600	1,462,600	2,782,500
Senior	206,200	122,200	470,700	799,100
Youth *(13 to 19 years)*	937,300	579,700	886,600	2,403,600
Post-Secondary Student	13,200	-	360,000	373,200
Other *(E.g. Tunnel, Combo, Auto Show)*	164,900	-	31,100	196,000
Total	**2,293,900**	**1,049,500**	**3,211,000**	**6,554,400**
(Ratio to 2016)	***(1.02)***	***(1.02)***	***(1.04)***	***(1.03)***

Exhibit 4-7: Strategy 2 System Revenue Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	$ 3,782,300	$ 879,500	$ 903,200	$ 5,565,000
Senior	$ -	$ 242,000	$ 517,400	$ 759,400
Youth *(13 to 19 years)*	$ -	$ 1,147,800	$ 1,545,100	$ 2,692,900
Post-Secondary Student	$ -	$ -	$ 742,700	$ 742,700
Other *(E.g. Tunnel, Combo, Auto Show)*	$ -	$ 698,700	$ 2,247,900	$ 2,946,600
Total	**$ 3,782,300**	**$ 2,968,000**	**$ 5,956,300**	**$ 12,706,600**
(Ratio to 2016)	***(1.04)***	***(1.01)***	***(1.02)***	***(1.02)***

As shown in Exhibits 4-6 and 4-7, this scenario is expected to provide minor increases to both overall ridership and fare revenue. Freezing fares at 2018 levels results in increased ridership across all fare classes, which in turn increases total revenues. This increase in ridership may require future service improvements if current loading conditions are to be maintained. However, it is likely that the additional ridership observed in this scenario could be accommodated by existing transit service.

Exhibit 4-8: Strategy 3 System Ridership Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	935,600	334,100	1,462,600	2,732,300
Senior	198,500	117,500	467,200	783,200
Youth *(13 to 19 years)*	938,300	579,700	886,600	2,404,600
Post-Secondary Student	13,200	-	346,000	359,200
Other *(E.g. Tunnel, Combo, Auto Show)*	164,900	-	31,100	196,000
Total	**2,250,500**	**1,031,300**	**3,193,500**	**6,475,300**
(Ratio to 2016)	***(1.00)***	***(1.00)***	***(1.03)***	***(1.02)***

Exhibit 4-9: Strategy 3 System Revenue Impacts

Fare Class	Cash	Ticket	Pass	Total
Adult	$ 4,006,400	$ 933,200	$ 903,200	$ 5,842,800
Senior	$ -	$ 256,800	$ 523,800	$ 780,600
Youth *(13 to 19 years)*	$ -	$ 1,267,200	$ 1,545,100	$ 2,812,300
Post-Secondary Student	$ -	$ -	$ 820,100	$ 820,100
Other *(E.g. Tunnel, Combo, Auto Show)*	$ -	$ 698,700	$ 2,247,900	$ 2,946,600
Total	**$ 4,006,400**	**$ 3,155,900**	**$ 6,040,100**	**$ 13,202,400**
(Ratio to 2016)	***(1.10)***	***(1.08)***	***(1.03)***	***(1.06)***

As shown in Exhibits 4-8 and 4-9, this scenario is expected to provide a minor increase to overall ridership and a somewhat larger increase to total revenue. Raising cash and ticket fares 2% year-to-year maintains existing ridership levels but results in increased revenue from these categories. Freezing fares for the rolling 30-day Pass at 2018 levels results in increased ridership, which in turn increases revenues for that category. This increase in ridership is smaller than the increase observed in Strategy 2 and therefore less likely to require additional service to accommodate the additional riders.

5 Recommended Strategy and Implementation

The following subsections detail our recommendations to Transit Windsor on fare structure and strategy, and how to implement them.

5.1 Fare Structure Recommendations for Smartcards and Mobile Ticketing

It is recommended that Transit Windsor expand the use of smartcards in their fare management system and introduce mobile ticketing as an additional payment option for customers.

The initial expanded use of smartcard should leverage the current smartcard system through configuration changes to add support for additional fare products and to establish additional revaluing infrastructure.

Transit Windsor should undertake a pilot with the mobile ticketing solution offered by Trapeze, and use observations and rider feedback during this pilot to more firmly establish mobile ticketing business and technical requirements. After the pilot period, there could be an assessment of whether to extend beyond the pilot period with Trapeze or conduct a competitive procurement.

Some or all of the legacy paper fare products could eventually be eliminated once the electronic fare media are seen as sufficiently reliable and available. This can help maximize electronic fare media usage levels, since the outcome would be that most regular riders would adopt electronic fare media.

5.1.1 Fare Products

Initially smartcards and mobile ticketing will be used to mirror existing fare products, subject to:

- The limitations of Transit Windsor's existing Trapeze solution (e.g., capability to support stored value on smart cards); and
- The desire to replace the monthly pass with a 30-day rolling pass.

Since mobile ticketing is initially proposed as a pilot, and there is significant logistical complexity in supporting concession fares with mobile ticketing, it is recommended that only standard fares be supported using mobile ticketing at first. Exhibit 5.1 indicates initial fare products to be made available for purchase for both smartcards and mobile ticketing.

Exhibit 5-1: Summary of Recommended Initial Fare Products

Fare Product	Smartcard - Adult	Smartcard - Concession	Mobile Ticketing - Adult
Single-ride (with 2hr. transfer window)	✓	✓	✓
Daily pass	✓	✓	✓
30-day rolling pass (for unlimited travel from day of first use)	✓	✓	✓

5.1.2 Fare Policy/Products

A variety of fare products and policy innovations could be conveniently supported using the smartcard and mobile ticketing technology, as shown in Exhibit 5-2 below. It is recommended that Transit Windsor consider these products and policies for future implementation, as appropriate, to supplement the flat fares and passes provided under the current fare structure and those initially deployed on electronic fare media. These additional fare policies and products would not require additional infrastructure or the use of conventional fare media since they would only be offered for smartcard and mobile ticketing purchases. All that would be required would be adjustments to the fare calculation logic in the system back office. In addition to the new options available to riders, these would also be an additional incentive for riders to adopt use of the electronic fare media.

Exhibit 5-2: Summary of Some Potential Fare Policies/ Products for Electronic Fare Media Only

Fare Policy Category	Fare Policy Type	Complexity	Examples
Loyalty Programs	Other Rolling Passes	Low-Medium	• Beyond the monthly rolling pass, other rolling period passes could be considered (e.g., *x* hours, daily, weekly)
	Bonus Fares	Medium	• 1 free trip for every 10 paid trips • $1 “refund” for every $10 loaded in stored value
	Fare Capping	High	• Pay multiple single-ride fares until daily/weekly/monthly cap is met, then all subsequent fares made in that time period are free
Differential Pricing	Fare Differential	Low	• Discount single-ride fare for customers using smartcard instead of cash
	Service-Based	Medium	• Charge discounted fares on non-express routes
	Peak/Off-Peak	Medium	• Charge discounted fares for trips during off-peak periods

5.1.3 Sales Channels

To accommodate the intended growth in smartcard usage, additional sales channels would benefit Transit Windsor and its customers. The degree of rider uptake in mobile ticketing could serve to moderate the extent of what is needed (i.e., part of the inherent role of mobile ticketing is as a sales channel), as such, it is recommended that additional sales channels be phased in over time. A summary is provided in Exhibit 5-3 below.

Exhibit 5-3: Summary of Recommended Sales Channels

Sales Channel	Supports Cash Payment	Supports Concession Fares
Customer Service Centre	✓	✓
Call Centre		✓
Website		✓
Mobile Application		
Retail Partner Locations	✓	✓

In addition, Transit Windsor could work with their vendor to distribute unattended add-value machines to support smartcard users.

5.2 Recommended Fare Strategy

It is recommended that Transit Windsor adopt the Strategy 3—Frequent Rider Discount decision package. In this Strategy, the cost of the rolling 30-day pass (replacing the existing monthly pass) will be held constant at 2018 levels while the cost of all other fare products would increase by 2% per year over the next 5 years. This strategy also includes:

- Providing no further discount on Senior fares;
- Maintaining student discounts on fares and passes, renaming the category to Youth, and limiting the availability to those between the ages of 13 and 19;
- Introducing a single-pass option to the APP, in co-ordination with the introduction of a smartcard or mobile ticketing system;
- Eliminating discounts for post-secondary student fares (replaced by U-Pass for UWindsor students);
- Extension of the current policy allowing children up to 12 years of age to ride free with a parent.
- Replacing paper tickets and passes with equivalents carried on the smartcards and mobile ticketing;
- Replacing the monthly pass with a rolling 30-day pass; and
- Introducing single-ride and daily pass options to APP.

As presented in Exhibits 4.4 through 4.9, this strategy is projected to maintain steady ridership levels along with a slight increase in fare revenue in comparison to the existing fare structure and policies.

This strategy offers a balance between maintaining and encouraging ridership through constant or discounted fare rates while maintaining a sustainable revenue stream. Importantly, this approach will maintain the City's financial investment in its transit service at a moderate rate of increase thereby allowing Transit Windsor to be proactive in improving transit service levels and maintaining a state of good repair.

As noted in Section 4.1 a number of these modifications, including expanding the APP and expanding the kids-ride-free program to include kids up to 12 years old, will likely result in a reduction in fare revenue. Given a fixed operating budget and target farebox recovery ratio, this potential reduction in revenue could negatively impact the ability of Transit Windsor to provide

transit service. To avoid these negative impacts, it is important to have a separate guaranteed fund from the City to cover any potential loss in fare revenue by Transit Windsor.

It should be noted that the ridership and fare revenue projections associated with the recommended fare policy are independent of any future changes to transit service levels, transit service quality and positive promotion of transit use in the city. Transit Windsor's current service delivery review is expected to alter service levels, and thus transit use, independent of fare structure changes. Transit ridership, and accordingly fare revenues, typically react negatively to transit service reductions, and large fare increases. They may also be influenced by negative attitudes towards the transit service in the community.

5.3 Implementation Recommendations

Implementing changes to the fare management system should limit inconvenience to customers and provide a smooth transition from their current Transit Windsor experience. New features should also be communicated to the public effectively, in advance of changes taking affect.

The upgraded Trapeze EZV36 fareboxes will support existing smartcards used in the Transit Windsor system, as well as mobile ticketing through a matrix code reader. Mobile ticketing is available as an option from Trapeze for an additional charge. Transit Windsor also has the option to at any point procure a mobile ticketing solution from another vendor.

We recommend offering all current fare products that are supported by Transit Windsor's existing Trapeze fare system on smartcards, and pursuing a pilot that includes all current fare products that are supported by the Trapeze mobile ticketing solution. Transit Windsor should consider leveraging the configurability of these systems to support additional fare products and discount/loyalty policies in the future. Since these would not be available except through these electronic fare media, this would also serve to increase their appeal.

Transit Windsor will use the pilot results to refine their mobile ticketing requirements, and for assessing options for continuing beyond the pilot. Such post-pilot options could include a competitive mobile ticketing procurement or refinement of the Trapeze initial deployment.

In summary, the following staged action plan is recommended:

- Introduce mobile ticketing pilot using Trapeze product and expand use of smartcards, with both configured for all current fare products.
- After the mobile ticketing pilot period, evaluate to decide whether to continue post-pilot and if so whether through continuation/improvements with Trapeze or a competitive procurement.